Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of selecting a hypothetical profile to model the profile of a structure formed on a semiconductor wafer to use in determining the profile of the structure using optical metrology, the method comprising:

obtaining sample diffraction signals from measured diffraction signals of structures formed on the wafer, wherein the sample diffraction signals are a representative sampling of the measured diffraction signals;

defining a hypothetical profile to model profiles of the structures formed on the wafer; and

evaluating the hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals,

wherein obtaining sample diffraction signals comprises:

obtaining measured diffraction signals, wherein the measured diffraction signals are obtained from a plurality of locations on the wafer;

determining a sample index, wherein the sample index corresponds to a number and a spacing of the sample diffraction signals;

determining a cost distribution associated with the determined sample index; and

adjusting the sample index when the determined cost distribution does not meet a cost criterion.

2. (Canceled).

3. (Currently Amended) The method of claim ~~2~~ 1, wherein the cost criterion is a percentage change in the cost distribution or a fixed quantity.

4. (Original) The method of claim 1, wherein defining a hypothetical profile comprises:

characterizing the hypothetical profile using two or more parameters.

5. (Original) The method of claim 1, wherein evaluating the hypothetical profile comprises:

(a) accessing a sample diffraction signal from the obtained sample diffraction signals;

(b) determining a simulated diffraction signal corresponding to the sample diffraction signal;

(c) determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal; and

(d) modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion.

6. (Original) The method of claim 5, wherein steps (a), (b), (c), and (d) are repeated for each of the sample diffraction signals.

7. (Original) The method of claim 5, wherein the sample diffraction signal accessed in step (a) is closest to a center of a range of sample diffraction signals.

8. (Original) The method of claim 1, wherein evaluating the hypothetical profile comprises:

(a) obtaining a sample diffraction signal;

(b) determining a simulated diffraction signal corresponding to the sample diffraction signal;

(c) determining a global minimum error; and

(d) modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion.

9. (Original) The method of claim 8, wherein steps (a), (b), (c), and (d) are repeated for each of the sample diffraction signals.

10. (Original) The method of claim 8, wherein the global minimum error is used to evaluate the performance of one or more global search algorithms.

11. (Original) The method of claim 1, further comprising:

determining sensitivity for one or more parameters that characterize the hypothetical profile; and

modifying the hypothetical profile when the determined sensitivity is not acceptable or does not meet a sensitivity criterion.

12. (Original) The method of claim 1, further comprising:

generating one or more mini-libraries based on the obtained sample diffraction signals, wherein a mini-library is smaller in size than a full library to be generated;

processing test diffraction signals using the one or more mini-libraries; and

estimating an averaged error and precision based on results of processing the test diffraction signals.

13. (Original) The method of claim 12, further comprising:

determining if the estimated averaged error and precision are acceptable; and

generating the full library when the estimated averaged error and precision are determined to be acceptable.

14. (Original) The method of claim 13, wherein determining if the estimated averaged error and precision are acceptable comprises:

providing the estimated averaged error and precision to a user.

15. (Original) The method of claim 13, wherein determining if the estimated averaged error and precision are acceptable comprises:

determining if the estimated averaged error and precision meet an error and precision criterion, wherein the precision criterion is approximately one order of magnitude less than the error associated with a photometric device to be used with the full library.

16. (Original) The method of claim 13, further comprising:

processing test diffraction signals using the generated full library; and

estimating an averaged error and precision for the full library based on results of processing the test diffraction signals.

17. (Original) The method of claim 13, further comprising:

altering the range and/or resolution of one or more parameters that characterize the hypothetical profile when the estimated averaged error and precision are not acceptable.

18. (Original) The method of claim 1, further comprising:

determining a measurement die pattern based on the sample diffraction signals, wherein each location in the measurement die pattern corresponds to each location on the wafer from which the sample diffraction signals were obtained.

19. (Original) The method of claim 18, wherein the measurement die pattern is used in advanced process control and process characterization.

20. (Currently Amended) A computer-readable storage medium containing computer executable code to select a hypothetical profile to model the profile of a structure formed on a semiconductor wafer to use in determining the profile of the structure using optical metrology by instructing a computer to operate as follows:

obtaining sample diffraction signals from measured diffraction signals of structures formed on the wafer, wherein the sample diffraction signals are a representative sampling of the measured diffraction signals;

defining a hypothetical profile to model profiles of the structures formed on the wafer; and

evaluating the hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals,

wherein obtaining sample diffraction signals comprises:

obtaining measured diffraction signals, wherein the measured diffraction signals are obtained from a plurality of locations on the wafer;

determining a sample index, wherein the sample index corresponds to a number and a spacing of the sample diffraction signals;

determining a cost distribution associated with the determined sample index; and

adjusting the sample index when the determined cost distribution does not meet a cost criterion.

21. (Canceled).

22. (Original) The computer-readable storage medium of claim 20, wherein evaluating the hypothetical profile comprises:

accessing a sample diffraction signal from the obtained sample diffraction signals;

determining a simulated diffraction signal corresponding to the sample diffraction signal;

determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal; and

modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion.

23. (Original) The computer-readable storage medium of claim 20, wherein evaluating the hypothetical profile comprises:

accessing a sample diffraction signal from the obtained sample diffraction signals;

determining a simulated diffraction signal corresponding to the sample diffraction signal;

determining a global minimum error; and

modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion.

24. (Original) The computer-readable storage medium of claim 20, further comprising:

determining a sensitivity for one or more parameters that characterize the hypothetical profile; and

modifying the hypothetical profile when the determined sensitivity is not acceptable or does not meet a sensitivity criterion.

25. (Original) The computer-readable storage medium of claim 20, further comprising:

generating one or more mini-libraries based on the obtained sample diffraction signals, wherein a mini-library is smaller in size than a full library to be generated;

processing test diffraction signals using the one or more mini-libraries; and

estimating an averaged error and precision based on results of processing the test diffraction signals.

26. (Original) The computer-readable storage medium of claim 25, further comprising:

generating the full library when the estimated averaged error and precision are acceptable; and

altering the range and/or resolution of one or more parameters that characterize the hypothetical profile when the estimated averaged error and precision are not acceptable.

27. (Original) The computer-readable storage medium of claim 20, further comprising:

determining a measurement die pattern based on the sample diffraction signals, wherein each location in the measurement die pattern corresponds to each location on the wafer from which the sample diffraction signals were obtained.

28. (Currently Amended) A system to select a hypothetical profile to model the profile of a structure formed on a semiconductor wafer to use in determining the profile of the structure using optical metrology, the system comprising:

a photometric device configured to obtain measured diffraction signals from structures formed on the wafer; and

a processing module configured to:

obtain sample diffraction signals from the measured diffraction signals, wherein the sample diffraction signals are a representative sampling of the measured diffraction signals; and

evaluate a hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals,

wherein the processing module is configured to obtain sample diffraction signals by:

determining a sample index, wherein the sample index corresponds to a number and a spacing of the sample diffraction signals;

determining a cost distribution associated with the determined sample index; and

adjusting the sample index when the determined cost distribution does not meet a cost criterion.

29. (Canceled).

30. (Original) The system of claim 28, wherein the processing module is configured to evaluate the hypothetical profile by:

accessing a sample diffraction signal from the obtained sample diffraction signals;

determining a simulated diffraction signal corresponding to the sample diffraction signal;

determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal; and

modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion.

31. (Original) The system of claim 28, wherein the processing module is configured to evaluate the hypothetical profile by:

accessing a sample diffraction signal from the obtained sample diffraction signals;

determining a simulated diffraction signal corresponding to the sample diffraction signal;

determining a global minimum error; and

modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion.

32. (Original) The system of claim 28, wherein the processing module is further configured to determine sensitivity for one or more parameters that characterize the hypothetical profile.

33. (Original) The system of claim 28, wherein the processing module is further configured to:

generate one or more mini-libraries based on the obtained sample diffraction signals, wherein a mini-library is smaller in size than a full library to be generated;

process test diffraction signals using the one or more mini-libraries; and

estimating an averaged error and precision based on results of processing the test diffraction signals.

34. (Original) The system of claim 33, wherein the processing module is further configured to:

generate a full library when the estimated averaged error and precision are acceptable; and

alter the range and/or resolution of one or more parameters that characterize the hypothetical profile when the estimated averaged error and precision are not acceptable.

35. (Original) The system of claim 28, wherein the processing module is further configured to:

determine a measurement die pattern based on the sample diffraction signals, wherein each location in the measurement die pattern corresponds to each location on the wafer from which the sample diffraction signals were obtained.